

The limits of voluntary programs for low-carbon buildings for staying under 1.5 °C

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Voluntary urban climate programs challenge firms and citizens to reduce resource consumption and carbon emissions at city level but without the force of law. High hopes are expressed about their capacity to accelerate a transition towards low-carbon building and city (re)development. This article explores, maps, and interrogates a global trend of voluntary urban climate programs, with a specific focus on action-networks, performance recognition programs, and eco-financing for low-carbon building initiatives. It finds that, thus far and within the boundaries of the literature reviewed, voluntary programs for building initiatives have not contributed to resource consumption and carbon emissions reductions at a level that will help achieving the goals of the Paris Agreement (i.e., staying under 1.5 °C). It concludes with approaches that will help to make better use of these programs.

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governance instruments are voluntary programs. Such governance interventions challenge firms and citizens to reduce carbon emissions at city level but without the force of law [6,7**].

High hopes are expressed about the capacity of such voluntary programs to accelerate a transition towards low-carbon cities [8–11]. This article reviews the literature on voluntary programs for low-carbon building and city (re)development to synthesise the knowledge on their development, implementation and performance, with a specific focus on action-networks, performance recognition programs, and eco-financing for building initiatives. It finds that they, overall, fall short in living up to the high normative expectations expressed about them. This indicates that not too much should be expected of these when aiming to achieve the goals of the Paris Agreement (i.e., staying under 1.5 °C). In the concluding section this article points out a way to use these voluntary programs in a more constructive manner than how they have been used thus far.

Why voluntary programs are looked upon as a solution for problems with mandatory regulation

It is not expected that the current policy trajectory for carbon emission reductions around the globe will achieve the goals of the Paris Agreement. More likely, an additional 35–50 per cent of carbon emissions need to be cut by 2030 to achieve the key ambition of a global temperature rise of maximum 1.5 °C [12]. In cities, particularly the built environment — predominantly buildings — holds a huge potential for carbon emission reductions [7**,13]. The construction, maintenance, and use of buildings accounts for approximately 40 per cent of global energy use and approximately 35 per cent of global carbon emissions [7**,13]. Because of rapid urbanisation, improvement in wealth, and access to modern energy services in the Global South, current building-related energy demand is expected to double over the next few decades, and as of 2010 building-related carbon emissions are expected to rise by 50–150 per cent by mid-century. With matured and widely applied technology and with behavioural and lifestyle changes, cost-effective energy consumption and carbon emission reductions can be achieved, ranging from 30 to 80 per cent. In short, the built environment holds the largest potential for a rapid and cost-effective transition towards a resource-efficient and low-carbon way of living [9,14] and could

Introduction

Governing the transition to low carbon cities is complicated (see introduction to the special issue). Traditional governance instruments for low-carbon building initiatives, such as mandatory building codes and planning legislation, have not been able to incentivise considerable reductions in resource consumption and carbon emissions at city level [1–3]. In response governments, firms, and other organisations have been trialling and experimenting innovative governance instruments for some decades now [4*,5,6,7**]. A popular form of innovative urban climate

considerably contribute to achieving the goals of the Paris Agreement.

There is, however, a major complication: dominant governance instruments, command and control type of regulatory interventions, have not yet been able to accelerate the transition to a resource-efficient and low-carbon built environment [15]. Whilst a range of problems have been pointed out about mandatory and often state-led governance interventions in this area [13,16], a few stand out. First is the long time it takes to develop and implement planning regulation, building codes and other city development policies as well as the time it takes to see their effects [17]. Second, mandatory, state-led interventions require considerable institutional capital, which is often lacking in countries in the Global South [18]. It is in the Global South, however, where urbanisation is progressing at an unprecedented speed [19]. Third, mandatory interventions predominantly regulate objects and not behaviour. Yet, the way humans behave in cities, and particularly how they use buildings (heating, cooling, water consumption, among others), is one of the major sources of city energy consumption and carbon emissions [20]. Fourth and final, mandatory interventions normally focus on future development and exempt existing parts of cities — buildings and infrastructure — from compliance [21]. Whilst understandable from a property rights point of view [22] this tradition is problematic because today's cities already contribute substantially to global carbon emissions.

Acknowledging these problems and seeking to accelerate the transition towards low-carbon cities, governments, firms, and civil society organisations have turned to alternative governance interventions [23]. A specific category of these are voluntary programs for building initiatives, including new construction, retrofits, and changed building user behaviour [7[•]]. Joining such programs comes with exclusive rewards — including information and knowledge, financial support, and access to peer and client networks — to those that commit to them [24]. Voluntary programs often resemble the structure of traditional governance interventions. They consist of a set of rules, monitoring and enforcement processes, and penalties or rewards for (non-)compliance [25]. They fit a logical development in an ongoing philosophy of deregulation, government reforms, and a larger rethinking the role of government and others in governing society [26]. It is often expected these voluntary programs will overcome the shortfalls of mandatory interventions. First, it is expected they are easier to develop and implement because they do not have to go through the checks and balances required for mandatory interventions, and they can target specific groups of firms or citizens rather than proposing a ‘one size fits all’ solution as mandatory interventions often do [27,28]. Second, higher levels of acceptance and compliance are expected of voluntary

programs because those targeted are often involved in their development [29], and because they voluntary commit to them rather than being forced to do so [30]. Third, win-win outcomes are expected as those committing to voluntary programs gain — through financial, information, or other rewards — and the targeted cities gain by seeing reduced carbon emissions [31].

Examples of voluntary programs for low-carbon building and (re)city development

Voluntary programs come in many shapes and forms; address different levels of building and city (re)development, management, and use; and build on different logics [4[•],7^{••},32–34]. It should be noted that these voluntary programs are often introduced as complements to existing mandatory programs, and not as replacements of these [7^{••},35,36]. By means of illustration three types are discussed based on the logics underlying voluntary programs. It goes without saying that an individual program may build on and combine different logics.

First are action networks at local, national and transnational level. These bring together various factors including national and city governments, transnational and local NGOs, firms and citizens [37,38]. Many of these are concerned with the high level of resource consumption and waste production at the urban level and directly or indirectly seek to contribute to the goals of the Paris Agreement [39]. Generally, they do so by generating and sharing knowledge on how specific urban climate problems may be addressed [40^{••},41[•]]. Examples include the local government-led Eco-Mileage in Seoul that incentivises citizens to reduce their car use, the national Australian City-Switch Green Office network that seeks changed user behaviour in existing office buildings, and the international citizen-led Transition Towns Network that provides tools and processes for citizens to take local climate action.

Second are performance recognition programs, including certification, labelling and benchmarking practices [42[•],43,44]. These target producers and consumers of products (e.g., buildings, energy) and services (e.g., transport, heating and cooling). They aim to ensure that participating producers can make their products and services credibly stand out from those of non-participants; and, that their consumers have certainty that these outperform mandatory requirements and comply with program requirements [24,45]. A typical example is the building certification program LEED (Leadership in Energy and Environmental Design). The program allows for buildings, building parts, building interiors, and city precincts to be certified in different classes of performance. The higher the class of certification the better the environmental performance, including reduced carbon emissions. Over hundreds of such programs have been identified across the globe [46–48].

Third are programs building on the notion of eco-financing [49–51]. Eco-financing builds on a popular win-win narrative: that improved resource efficiency at city level (and related reduced carbon emissions) come with financial gains for those participating in these programs [52,53]. Environmental upgrade financing is one of many forms of eco-financing. In these programs governments act as intermediaries in generating funds for environmental upgrades. They seek to take away risks experienced by banks and other finance providers in supplying funds for low-carbon retrofits. It was first introduced in the United States as a nation-wide program in 2008: Property Assessed Clean Energy (PACE) [54]. Another form of eco-financing are revolving loan funds like the Amsterdam Investment Fund. It was established by the Amsterdam City Council in 2011 to fund projects that contribute to the built environment sustainability goals of the City of Amsterdam, which include a 40 per cent reduction of carbon emissions by 2025, as of 1990 emissions, and a 70 per cent reduction by 2040 [55]. Funds are ‘revolving’ because once paid back to the central fund it can issue new loans to other projects [49,56,57].

Assessing voluntary program performance

Some evaluations present positive performance of voluntary programs and particularly laud the ‘best practices’ generated through them, but in general, evaluations present a worrisome picture [58*,59–62]. In broad terms, the voluntariness of these programs is questioned as they allow local and higher levels of government to reconfigure existing forms of authority [63–65]. When governments are not involved in these programs there is a risk they bypass democratic processes of accountability and transparency — which is critical given that they address a fundamental societal problem [66–68]. There is a risk of these programs merely tinkering at the edges of urban climate challenges but with major reputational gains for participants and program administrators [40**,69**,70]. There also is a risk that the broad suite of voluntary programs results in fragmented and piecemeal responses rather than a coherent approach to reduce carbon emissions at city level [60]. A final risk mentioned frequently is that participants can easily pull out of programs when expected results do not materialize [71].

When considering the types discussed above, action networks are found to attract already leading governments, firms, citizens, and cities [38,72]. There is some evidence that they are exclusive rather than inclusive [73,74]; and the replicability and scalability of their practices is questioned as these are often highly context dependent ([60] — albeit that some evidence has been presented on potential non-linear scaling processes of voluntary programs [75]). Others have highlighted that members in a network do not have equal access to benefits of those networks [74]; or that they spur a reconfiguration of authority in ways that bypass or escape local processes

of accountability and democratic decision making [76,77]. An issue that has received less attention in the literature thus far is that these networks may produce an illusion of active and successful governments, firms, citizens, and cities in climate action [7**,78]. Performance recognition programs, on their turn, have been critiqued also. Differences in program designs increase information barriers between producers and consumers rather than reduce them [79]. It also allows producers to game this type of programs by seeking a program or performance criteria that allow for easy but not necessarily low-carbon solutions that will still allow them to market their goods and services as contributing to low-carbon city development [80]. Likewise, eco-financing has been found flawed. Scholars point out that the promise of a win-win situation does often not materialise; that eco-financing is often only available to those with the capacity to understand and follow through the application process; and that eco-financing still requires participants to bear the costs of non-financed parts of low-carbon solutions [31,81*].

A recent systematic analysis of the development and performance of 60 voluntary programs for low-carbon building development, transformation and use in major cities in Australia, India, Malaysia, the Netherlands, Singapore and the United States underscores and quantifies these findings [7**]. Table 1 provides a snapshot of this study, highlighting 15 typical programs studied (five examples from each of the types discussed before).

The picture that emerges from Table 1 is consistent, but not hopeful. It indicates that those targeted by voluntary programs for building initiatives have little interest in these, and that these programs’ overall contribution to reduced building-related resource consumption (predominantly energy consumption during operation) or carbon emissions is minimal. Whilst the built environment holds a potential for considerable carbon emission reductions at net cost benefit, these programs generally do not achieve reductions of more than one per cent within the market they target. This is well below the 35–50 per cent additional reductions required to achieve the goals of the Paris Agreement (i.e., staying under 1.5 °C). Of course, such voluntary programs potentially have a transformative impact even when their initial performance is minimal — including spill-over effects, increased awareness, and the testing of new technologies [82,83]. However, whilst such potential is frequently pointed at by proponents of voluntary programs, we lack empirical evidence that over time this potential materialises [25,84].

The programs experience most interest in new office buildings in the central business districts of major cities. These buildings are normally occupied (owned or rented) by major firms and government agencies that require sustainable building space. Smaller firms and occupants of residential property are less interested in sustainable

Table 1**Snapshot of results from 'van der Heijden, 2017' study.**

Name, focus (type, city/country, year of introduction) ^a	Participants relative to pool of prospective participants	Average reductions by participants	Reductions in perspective
1200 Buildings: office retrofitting (eco-financing, Melbourne, Australia, 2010)	4 per cent.	Unknown (too few – less than 10 – buildings retrofitted yet).	Insignificant ^c compared to Melbourne's commercial building energy consumption.
Additional credit for energy efficient homes: residential retrofitting (eco-financing, Netherlands, 2012)	Less than 1 per cent.	Unknown (too few houses constructed or retrofitted).	Insignificant compared to the Netherlands' residential building energy consumption.
Amsterdam Investment Fund: commercial and residential building energy upgrades (eco-financing, Amsterdam, Netherlands, 2011)	Less than 5 per cent (a handful of projects are funded).	Unknown (too few – less than 10 – projects supported yet).	Marginal contribution to the City of Amsterdam's ambition of 20 per cent carbon reductions by 2020.
Better Buildings Challenge: commercial building energy upgrades (action network, United States, 2011)	Less than 1 per cent (representing 4 per cent of commercial building space).	2 per cent energy consumption reduction (with a quarter of participants having achieved at least 10 per cent).	Less than 0.5 per cent of commercial building energy consumption in the United States.
Better Buildings Partnership: office retrofitting (action network, Sydney, Australia, 2011)	100 per cent (all 14 initially targeted rule-takers).	35 per cent CO ₂ emission reduction (on track to reach 70 per cent by 2020).	Applies to Sydney's central business district only. The larger Sydney Metropolitan area is 500 times larger.
Billion Dollar Green Challenge: educational facilities energy upgrades (eco-financing, United States, 2011)	1 per cent.	Over 20 per cent energy consumption reductions.	Insignificant compared to the energy consumption of educational facilities in the United States.
Chicago Green Office Challenge: office retrofitting (action network, Chicago, United States, 2008)	Less than 1 per cent.	Less than 10 per cent energy consumption reductions.	Insignificant compared to Chicago's commercial building energy consumption.
CitySwitch Green Office: commercial building energy upgrades (action network, Australia, 2010)	6 per cent.	13–16 per cent energy consumption reductions.	Less than 1 per cent of office building energy consumption in Australia in 2011.
Eco-Housing: residential building energy upgrades (performance recognition program, Pune, India, 2004)	Less than 1 per cent.	Unknown (too few projects – less than 10 – constructed yet).	Insignificant compared to Pune's residential building energy consumption.
Energy Star Building: residential building energy upgrades (performance recognition program, United States, 1999)	3 per cent.	Over 20 per cent energy consumption reductions (but paper performance ^a).	Less than 1 per cent of residential building energy consumption in the United States.
EnviroDevelopment: commercial and residential building energy upgrades (performance recognition program, Australia, 2006)	6 per cent (of new residential buildings).	Over 20 per cent energy consumption reductions.	Approximately 1 per cent of residential building energy consumption in Australia.

Table 1 (Continued)

Name, focus (type, city/country, year of introduction) ^a	Participants relative to pool of prospective participants	Average reductions by participants	Reductions in perspective
<i>Green Township:</i> city wide building energy upgrades (performance recognition program, Malaysia, 2009)	Less than 1 per cent.	Unknown (only two projects pre-certified; no projects completed yet).	Insignificant compared to Malaysia's urban building energy consumption.
<i>LEED:</i> commercial and residential building energy upgrades (performance recognition program, global program but launched in the United States, 2000)	3 per cent (of new office buildings).	Over 20 per cent energy consumption reductions (but paper performance ^b).	Approximately 0.5 per cent of commercial building energy consumption in the United States.
<i>Small Business Improvement Fund:</i> commercial building energy upgrades (eco-financing, Chicago, United States, 2000)	Less than 5 per cent.	Less than 20 per cent energy consumption reductions.	Insignificant compared to Chicago's commercial building energy consumption.
<i>Zonnig Huren ('Sunny Leasing'):</i> residential retrofits (2012)	Less than 2 per cent.	Over 20 per cent energy consumption reductions.	Insignificant compared to residential building energy consumption in the Netherlands.

^a Source: van der Heijden, 2017; for extensive case descriptions see http://jeroenvanderheijden.net/research_current_VENI_database.html (16 May 2017).

^b The term 'paper performance' indicates that these are expected reductions, not observed reductions; for example, most certification and classification programs studied have issued certificates for the design of a building and not the performance of a building in operation [48].

^c The qualitative descriptor 'insignificant' indicates a maximum of 0.5 per cent.

buildings, and likewise, owners and occupants of existing buildings have little interest in these, the study finds. This also explains why only one of the programs studied indicated promising performance considering meeting the ambitions of the Paris Agreement: The Better Building Partnership in Sydney, Australia. This is a voluntary program that targets the very top-end of the commercial office market in Sydney. The Partnership covers the relatively small area of the Sydney central business district and only applies to some 100 high-profile office buildings. It is an absolute elite-group of property sector leaders; managing a total of AU\$105 billion worth of property, which indicates they have the financial means for carrying out retrofits.

The study finds that voluntary programs for low-carbon building and city (re)development overall face three major barriers. First is attracting participants. Most programs studied had attracted between 1 and 5 per cent of the market it targeted. LEED in the United States, for example, has been applied to approximately 2 per cent of all new buildings built since the program was introduced in the year 2000. Second is affecting participant behaviour. Most the programs studied did not see resource or carbon emission reductions at participant level of more than 20 per cent compared to mandatory requirements. Although at first this may seem a promising improvement, it should be considered in the light of very low mandatory

requirements (making it relatively easy to move 'beyond compliance') and a use of conventional techniques and behavioural interventions to achieve reductions to achieve these — the use of solar photovoltaic cells to generate energy, remote sensors to switch off appliances when not in use, among others. Third, and resulting from the above, the overall impact of the voluntary programs was found insignificant relative to the problems they seek to address. For example, a voluntary program targeting office energy consumption in Australia, CitySwitch Green Office, had reduced approximately 0.8 per cent of Australian energy office consumption over a five-year period, and a certification programs for homes in the United States, Energy Star, had seen less than 1 per cent energy reduction in the domestic market since it was introduced in 1999. Finally, the study found that the overall pattern of poor performance did not differ between the developed and rapidly developing economies included in the study. However, it concluded that voluntary programs face higher risks in the latter because of issues such as corruption, a lack of mandatory regulation as a benchmark for the voluntary programs, and a lack of institutional capital [70].

Discussion and conclusion: striking a balance between voluntary programs and mandatory interventions

Voluntary programs for building initiatives have rapidly gained prominence in addressing urban climate

challenges. This in response to limitations experienced with mandatory instruments. From the outset, voluntary programs hold much promise to contribute to achieving the goals of the Paris Agreement (i.e., staying under 1.5 °C). Yet, after close to two decades of trialling them it has become clear that not too much should be expected from them in the transition to low-carbon and environmentally friendly building and city (re)development and use. Within the boundaries of the literature reviewed here, they have been found to struggle with attracting participants, with ensuring meaningful energy or carbon emission reductions by participants either through use of technology or changed building use, and with making an overall significant contribution to the urban climate challenges they seek to address.

Although a bleak conclusion, it is, however, not a call to stop applying voluntary programs for building initiatives. They have generated thousands of ‘best practices’ globally on how carbon emissions at city level can be reduced [34,85,86]. Like mandatory instruments, voluntary programs have strengths and weaknesses. A way forward may be to look for fruitful combinations of voluntary programs and mandatory interventions, building on the strengths of each category and overcoming weaknesses [70]. A promising way forward, for example, may be the inclusion of voluntary programs in rolling rule regimes [87,88]. Such regimes mandate that today’s leading practice in a voluntary program will be the bottom line in mandatory planning legislation and building codes within, say, 10 years — Japan’s Top Runner Program for home appliances and motor vehicles [89]. This still incentivises participants and administrators of voluntary programs as they can set the future bottom line and possess the experience necessary to achieve it, but it would also actively push the mainstream market to follow suit within the time-frame set. That way voluntary programs may contribute to achieving the goals set in the Paris Agreement.

In similar vein, while a bleak conclusion, it is not a call to stop studying these voluntary programs. Future studies may seek to better understand, for example, whether particular logics underlying voluntary programs are more promising than others. Alternatively, scholars may seek to explore whether voluntary programs introduced by governments are more promising than those introduced by NGOs or firms; whether voluntary programs are promising in some cities or countries and not others; or whether the scale of intervention (user behaviour, building retrofit, precinct upgrade, among others) affects program performance.

Conflict of interest statement

Nothing declared.

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